

What is claimed is:

1. (*Currently Amended*) A thermoplastic polyurethane polymer comprising the reaction product of:

- (a) at least one hydroxyl terminated polyether intermediate having a number average molecular weight of at least 1200 Daltons;
- (b) at least one diisocyanate polyisocyanate; and
- (c) at least one hydroxyl terminated chain extender;

wherein said polymer formed by reacting (a), (b), and (c) is crosslinked with at least one crosslinking agent made by reacting (i) a hydroxyl terminated polyester polyol selected from the group consisting of polyester, polycaprolactone, polycarbonate and mixtures thereof; and (ii) at least one diisocyanate polyisocyanate; wherein said hydroxyl terminated polyester polyol in (i) is made by reacting a dicarboxylic acid with a mixture of at least one branched glycol and at least one straight chain glycol.

Claim 2 (*Cancelled*).

3. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 wherein said diisocyanate is diphenyl methane-4,4' diisocyanate.

4. (*Original*) The thermoplastic polyurethane polymer of claim 1 wherein said hydroxyl terminated polyether intermediate has a number average molecular weight of from about 1500 to about 4000 Daltons.

5. (*Original*) The thermoplastic polyurethane polymer of claim 4 wherein said hydroxyl terminated polyether intermediate has a number average molecular weight of from about 1800 to about 2500 Daltons.

6. (*Original*) The thermoplastic polyurethane polymer of claim 5 wherein said hydroxyl terminated polyether intermediate is polytetramethylene ether glycol.

Claims 7-9 (*Cancelled*).

10. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 9, wherein said dicarboxylic acid is adipic acid.

Claims 11-12 (*Cancelled*).

13. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 12, wherein said branched glycol is neopentyl glycol.

14. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 12, wherein said straight chain glycol is selected from the group consisting of 1,4-butanediol and 1,6-hexanediol.

15. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 12, wherein said glycol is a 50/50 mole percent mixture of neopentyl glycol and 1,4-butanediol.

16. (*Original*) The thermoplastic polyurethane polymer of claim 1 wherein said polymer has a weight average molecular weight before adding said crosslinking agent of from about 150,000 to about 800,000 Daltons.

17. (*Original*) The thermoplastic polyurethane polymer of claim 16 wherein said weight average molecular weight is from about 200,000 to about 400,000 Daltons.

18. (*Original*) The thermoplastic polyurethane polymer of claim 17 wherein said weight average molecular weight is from about 250,000 to about 350,000 Daltons.

19. (*Currently Amended*) The thermoplastic polyurethane polymer of claim 1 & wherein said crosslinking agent has a number average molecular weight of from about 1,000 to about 10,000 Daltons.

20. (*Original*) The thermoplastic polyurethane polymer of claim 19 wherein said crosslinking agent has a number average molecular weight of from about 1,500 to about 4,000 Daltons.

21. (*Original*) The thermoplastic polyurethane polymer of claim 20 wherein said crosslinking agent has a number average molecular weight of from about 1,800 to about 2,800 Daltons.

22. (*Original*) The thermoplastic polyurethane polymer of claim 1 wherein said hydroxyl terminated chain extender is 1,4-butanediol.

23. (*Original*) The thermoplastic polyurethane polymer of claim 21 wherein said crosslinking agent is used at a level of from about 5.0 to about 20.0 weight percent of the total weight of said polymer and said crosslinking agent.

24. (*Original*) The thermoplastic polyurethane polymer of claim 23 wherein the level of said crosslinking agent is from about 8.0 to about 17.0 weight percent.

25. (*Original*) The thermoplastic polyurethane polymer of claim 24 wherein the level of said crosslinking agent is from about 10.0 to about 17.0 weight percent.

26. (*Original*) The thermoplastic polyurethane polymer of claim 1 in the form of a fiber.

27. (*Original*) The thermoplastic polyurethane polymer of claim 26, wherein said fiber has a size of from about 20 to about 240 denier.

Claim 28 (*Cancelled*).

29. (*Currently Amended*) A process for producing melt spun thermoplastic polyurethane fibers comprising:

- (a) melting a polyether thermoplastic polyurethane polymer in an extruder, said thermoplastic polyurethane polymer made by reacting (i) at least one hydroxyl terminated polyether intermediate having a number average molecular weight of at least 1200 Daltons, (ii) at least one diisocyanate polyisocyanate, and (iii) at least one hydroxyl terminated chain extender;
- (b) adding to said melted thermoplastic polyurethane polymer at least one crosslinking agent made from reacting (i) a hydroxyl terminated polyester polyol selected from the group consisting of polyester, polycaprolactone, polycarbonate, and mixtures thereof, and (ii) at least one diisocyanate polyisocyanate; wherein said hydroxyl terminated polyester polyol in (i) is made by reacting a dicarboxylic acid with a mixture of at least one branched glycol and at least one straight chain glycol;
- (c) feeding said melted thermoplastic polyurethane polymer mixed with said crosslinking agent to at least one spinneret;
- (d) passing said melted polymer containing said crosslinking agent through said spinneret to produce melt spun fibers;
- (e) cooling said fibers; and
- (f) winding said fibers onto bobbins.

30. (*Original*) The process of claim 29 wherein said crosslinking agent is added to said melted polyether thermoplastic polyurethane polymer in said extruder.

31. (*Original*) The process of claim 29 wherein said crosslinking agent is added to said melted polyether thermoplastic polyurethane polymer after said polymer exits said extruder.

32. (*Original*) The process of claim 31 wherein said crosslinking agent and said polymer are mixed with a dynamic mixer.

33. (*Original*) The process of claim 31 wherein said crosslinking agent and said polymer are mixed with a static mixer.

Claim 34 (*Cancelled*).

35. (*Currently Amended*) The process of claim 29 34 wherein said crosslinking agent has a number average molecular weight of from about 1,800 to about 2,800 Daltons.

Claim 36 (*Cancelled*).

37. (*Currently Amended*) The process of claim 29 36 wherein said dicarboxylic acid is adipic acid.

Claims 38-39 (*Cancelled*).

40. (*Currently Amended*) The process of claim 29 39 wherein said branched glycol is neopentyl glycol.

41. (*Original*) The process of claim 29 wherein said bobbins are wound at a speed of from about 100 to about 3000 meters per minutes.

42. (*Original*) The process of claim 41 wherein said bobbins are wound at a speed of from about 300 to about 1200 meters per minute.

43. (*Original*) The process of claim 29 wherein said fibers have a size of 240 denier or less.

44. (*Original*) The process of claim 43 wherein said fibers have a size of from 20 to 240 denier.

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45. (*Original*) The process of claim 29 wherein said crosslinking agent is used at a level of from about 5.0 to about 20.0 weight percent of the total weight of said polyether thermoplastic polyurethane polymer and said crosslinking agent.